these numbers can now be taken. Enormous quantities of shad have been bred from the egg and sent into the waters in order to renew the supply; many millions of healthy young fish are thus annually added to the stock, and fresh rivers are now being populated with shad.

Another fish to which the commission has of late directed its attention is the carp, *Cyprinus carpio*, and var. It is a fish which is thought to be eminently calculated for the warmer waters of America, and especially suited to the mill-ponds and sluggish rivers and ditches of the south. Some most interesting information is given about the carp and its numerous varieties, but it is too detailed for quotation. Another noteworthy feature of American fish-culture is the transport, in "an aquarium car," to the coast and inland waters of California, of various fishes and crustaceans of North America, in order to test the question of whether they could be acclimatised in the warmer latitudes of the Pacific. The first experiment failed through an accident on the railway, but on June 12, 1874, the car arrived safely with its interesting freight. Out of a lot of 150 lobsters which were placed in the aquarium car, only four, however, were left alive on reaching San Francisco Bay, and these were put into the sea at Oakland Wharf, nine days after they had been taken from the Atlantic Ocean. It is thought probable that the four specimens did not ultimately live, but as two of the four were big with spawn it is probable the eggs would come to maturity, as the death of the parent does not kill the spawn. Lobster eggs, unlike fish ova, are fructified before they leave the body of the animal.

An interesting account is given in the present volume of the American oyster fisheries.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

Indian Rainfall and Sun-spots

SINCE my last communication to you on the above subject I have had some correspondence with Mr. Hill, the meteorological reporter to the North-West Provinces, in the course of which he has given me a more definite account of the results of his investigations. The outcome of our joint researches may be broadly stated as follows:—In years of maximum sun-spot the summer rainfall is *above* and the winter rainfall *below* the average, while in years of minimum sun-spot the reverse conditions hold, viz., the summer rainfall is *below* and the winter rainfall *above* the average.

Though the preceding hypothesis can only be considered at present in the light of a probability, it is considerably strengthened by the fact that, unknown to each other, Mr. Hill and myself have each taken it as the basis of our separate, and until recently, independent lines of inquiry. Mr. Hill has already sent in a short report to Government of the results of his own investigations, which he roughly states in the following words:—"I have examined the rainfall of Benares, Allahabad, Agra, Bareilly, Roorkee, Dehra, Mussoorie, and Naini Tal, since 1861, and I find that on the average the *total* annual rainfall of the maximum sun-spot years 1861, 1869, 1870, and 1871, is about 14 per cent. above the average for the whole period, and that of the minimum group 1866, 1867, and 1868, about 4 per cent. below it. On the other hand, when only the *winter* rainfall is considered, the defect in maximum sun-spot years is about 21 per cent. of the average winter fall, and the excess in minimum sun-spot years is above 20 per cent." Unfortunately no further data appear to be available in the North-West Provinces, as during the mutiny decade, 1851–1860, no register was kept, and before the mutiny the Schlagintweits took away to Germany most of the old rainfall records. The results, however, as far as they go, are in complete accordance with those I have obtained from a similar comparison of some of the rainfalls in Bengal.

The chief obstacles in the way of making a thoroughly complete and exhaustive comparison of the rainfalls throughout Northern India are (1) the paucity of registers, and (2) the limited periods over which they extend. In the single case of Calcutta the latter objection does not apply, since by dint of some trouble I have succeeded in obtaining the monthly as well as the annual falls for a period of forty years, from 1833 to 1876 inclusive. As this comprises four complete sun-spot cycles, the results are extremely valuable, especially as they tend to exhibit what Prof. Balfour Stewart considers to be the true test of a physical cycle, viz., its repetition.

I here append a comparison of the rainfall of Calcutta, for the months of January, February, and March, arranged in four groups of minimum and maximum sun-spot years, together with the years immediately preceding and following them (except in the case of the former, where the rise after the minimum is often very rapid).

Minimum sun-spot groups.		Maximum sun-spot groups.	
Years.	Total of each group.	Years.	Total of each group.
	inches.		inches.
1842 1843 1844	7·80	1836 1837 1838	3·54
1854 1855 1856	7·29	1847 1848 1849	6·68
1865 1866 1867	12·89	1859 1860 1861	6·42
1875 1876 1877	14·60	1869 1870 1871	9·76
Total of all the groups.	42·58	Total of all the groups.	26·40

In addition to this it may be noted that the total fall during the same three months of the four absolute minimum sun-spot years 1843, 1856, 1867, and 1877 (probable minimum) is 15·98 inches, while that of the four absolute maximum sun-spot years, 1837, 1848, 1860, and 1870, reaches only the insignificant amount of 2·48 inches. Similar results are obtained if the month of April and the months of November and December of the preceding years are respectively included, thus evidently showing that the relation is one connected with the seasonal distribution of the rainfall and not merely a coincidence, resulting from having taken the rainfalls of special months.

If we treat the rainfall of Dehra, from 1861 to 1877, in a somewhat similar manner, by taking the rainfalls of January, February, and the previous December, and consider 1861, 1862, and 1863 to approximately represent a maximum group, the results are as follows:—

Minimum sun-spot groups.		Maximum sun-spot groups.	
Years.	Total of each group.	Years.	Total of each group.
	inches.		inches.
1865 1866 1867	22·1	1861 1862 1863	2·6
1875 1876 1877	13·3	1869 1870 1871	10·5

I think an examination of the preceding comparisons of the winter rainfalls of Dehra and Calcutta (rough though they undoubtedly are) discloses distinct evidence of repetition in

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unison with the sunspot periods, at all events enough to warrant further and more complete investigations being made on the point. I will not trespass on your valuable space further than to add a similar rough indication of the inverse relation that holds in the case of the summer rainfalls. They will be seen to be greatest in years of maximum sunspot.

In the following groups the rainfall of Dehra is taken for the months of June, July, August, September, and October during which the south-west monsoon rains fall. I give the separate rainfall during these months for each year, as well as the totals and averages.

Maximum sun-spot groups.			Minimum sun-spot groups.		
Years.	Inches.	Totals.	Years.	Inches.	Totals.
1861	91·4	181·9	1875	67·2	143·3
1862	90·5		1876	76·1	
Average for each year		90·9	Average for each year		71·6
1869	70·5	247·9	1865	58·9	186·5
1870	77·2		1866	67·0	
1871	100·2		1867	60·6	
Average for each year		82·6	Average for each year		62·1

The averages give a mean average excess in each year in the maximum sun-spot groups of 19·9 inches over each year in the minimum groups; a gigantic difference certainly, and apparently maintained pretty consistently throughout by the rainfall of each year. The defect in the winter rainfall of years of maximum sunspot and the corresponding excess in years of minimum sunspot together combine to render the excess in years of maximum sun-spot less apparent in the total annual falls, though it still exists to a certain extent. The present year (at present abnormally deficient in solar activity) appears destined to fulfil the preceding relations to an alarming extent. The winter rainfall was unusually plentiful throughout Northern India, while, up to the present time, when the monsoon should be in full swing, the rains, except in Eastern Bengal, have been so scanty that unless rain falls soon and abundantly, we shall have to face a famine as fearful as that which is just now devastating Madras.

E. D. ARCHIBALD

Greening of Oysters

IT has long been known that oysters, when removed from the sea and kept artificially in shallow pits filled with salt-water, assume a green colour which is or was much thought of by epicures. While this spring at Le Croisic, at the mouth of the Loire, my friend, Dr. Bornet, informed Prof. Lankester and myself that this singular change was particularly observable in the oyster preserves in the neighbourhood. He was at that time at a loss for an explanation, but I have just received a letter from him in which he gives the solution of the problem, and this will I think be so interesting to many of the readers of NATURE, that I have ventured, although without his permission, to communicate it to them.

"As a souvenir of our meeting at Croisic, I send you some *Corallinaceæ* from that locality. Several have not yet been detected on the English coast, where, however, they ought to occur. I have added a Diatom, *Navicula fusiformis*, Grunow, var. *ostrearia*. This species, whose contents are of a cobalt-blue colour during life, occurs in profusion in the oyster-preserves of Croisic, and it is because they feed on this Diatom that they become green. Nothing is easier than to demonstrate the fact by placing white oysters in a plate of sea-water containing nothing but *Navicula fusiformis*, and the "greening" takes place in thirty-six hours. As often as the experiment is repeated, the same result follows. But why should *Navicula fusiformis* be blue, while all other Diatoms are colourless?"

W. T. THISELTON DYER

P.S.—Since this note has been in type Prof. Oliver has called my attention to a paper in the "Mémoires de la Société Linnéene du Calvados," 1824, pp. 135-158, by Benjamin Gaillon, "Sur la cause de la coloration des Huîtres et sur les Animalcules qui servent à leur nutrition." These animalcules form masses which he compares to the green matter of Priestley, and as he refers them to the genus *Navicula* of Bory, they are no doubt identical with those which Dr. Bornet has studied. Gaillon refers to an earlier memoir of his own on the same subject published by the Academy of Sciences of Rouen, and in the *Annales des Sciences Physiques*, for 1821. W. T. T. D.

Reproduction by Conjugation

THE phenomenon to which Mr. Bennett alludes is, I presume, well known; but it is not universal, though common. He will find illustrations in Hassall's "British Freshwater Algæ," where the zygospores are formed in both filaments simultaneously; *e.g.*, plate 19, *Zygnema* (Spirogyra); plate 38, several species of *Tyndaridea*. But in those genera in which the Zygospore is formed *between* the filaments it would seem impossible to decide which is male and which is female, *e.g.*, plate 39, *Tyndaridea conspicua*, *immersa*, *Ralfsii*, and *decussata*; or in the genera *Mesocarpus*, plates 42–47, and *Stenocarpus*, plates 47–49.

GEORGE HENSLOW

Strange Dream Phenomenon

AFTER reading the interesting letter on a "Strange Dream Phenomenon" which appeared in NATURE (vol. xvi. p. 329) it occurred to me that it might be worth while to put on record the following experience which connects in a very striking manner the phenomena of dreaming and subjective vision. Some time ago, when rather tired by overwork, I dreamt during the night that some one had entered my bedroom and was approaching the pillow under my head with the intention of abstracting some valuable papers which I fancied were concealed beneath it. I noticed in every particular the dress, stature, and features of the intending robber, but just as he put forward his hand towards the bed I began to awake, slowly at first, but with great celerity as soon as I perceived the figure of my dream walking slowly down the side of the bed; wide awake now, I watched it reach the corner bedpost, turn round, and with measured noiseless step pass along the foot, till on coming between the window and myself it disappeared, as all the "ghosts" with which I was then afflicted were wont to do when shone through by the light.

I did not sleep any more for the rest of the night, and hence am perfectly certain that this was not "a dream within a dream," but a clear case of a subjective vision prolonged from the sleeping into the waking state, and thus affording evidence to prove the essential identity which underlies the phenomena of "dreaming dreams" and seeing "ghosts." W. J. S.

OUR ASTRONOMICAL COLUMN

THE SATELLITES OF MARS.—The Paris correspondent of the *Times*, writing on August 27, states that at the meeting of the Academy of Sciences the same day, M. Faye had announced the independent discovery of the satellites of Mars by M. Borrelly at Marseilles, claiming for him even an earlier detection than was effected at Washington. Prof. Watson's name being introduced as the American discoverer instead of that of Prof. Asaph Hall, it is clear that the statement has arisen from a misconception on the part of the reporter at the sitting of the Academy, who has confounded the discovery of No. 174 of the minor-planet group, by Watson and Borrelly, with that of the satellites of Mars.

A letter from Rear-Admiral Rodgers, Superintendent of the Naval Observatory, Washington, to the Secretary of the Navy, dated August 21, furnishes particulars of the observations and calculations bearing upon both satellites, which had been made up to that date. The outer satellite was remarked on the 11th, but its true character was not certainly recognised until the 16th. On the following night Prof. Hall first observed the inner satellite. The discoveries were telegraphed to Messrs. Alvan Clark and Sons, at Cambridgeport, on the 18th, that confirmatory evidence of the existence of the satellites might be obtained by means of the 26-inch telescope of Mr. McCormick, at present in the hands of those eminent opticians, who succeeded in verifying Prof. Hall's discovery, as did also Prof. Pickering and his assistants at Cambridge, Mass. On the 19th the discovery was

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